



LINUX Expert

Linux is a heavyweight alternative to Windows and others but it has its competition. Daniel Goscomb looks at UNIX systems that offer similar services and could pack a mean punch, depending on your needs



WORDPRESS 2.0 RELEASED

Version 2.0 of WordPress, one of the web's most popular blogging tools, has been released. The new version comes with a number of features that will be attractive to non-technical users. New features include WYSIWYG editing, user roles and easy database backups. The developers have also embraced AJAX technology, allowing features such as drag-and-drop editing and making the management interface less 'web-like' and more like a standard application.

■ OPEN-SOURCE VIRTUOZZO

SWSOft has released OpenVZ, an open-source version of its Virtuozzo server virtualisation software. The release aims to increase the development speed of the company's commercial products by using the drive and skills of the open-source community to speed up development.

Some analysts believe that SWSOft is doing this to out-source kernel development, allowing the company to focus on product development and marketing. By releasing this open-source version, SWSOft will also be able to raise the profile of this type of virtualisation and compete with products such as Xen and VMware.

■ RED HAT HAS RECORD QUARTER

Red Hat now sees itself as "among the fastest growing mid-cap technology companies in the world", following record growth in its third fiscal quarter. The company reported an increase in revenue of 44 per cent from last year, with an operating margin expanding to 26 per cent and cash flow for the quarter up 82 per cent year-over-year to \$54.1 million (around £31m).

Charlie Peters, executive vice-president and chief financial officer of Red Hat, said that "solid growth across key metrics indicates not only strength in the demand for our solutions but also continuing improvements in the day-to-day operations of our business".

We have discussed Linux in depth on these pages and demonstrated what a versatile and useful system it can be. But is Linux always the best tool for the job? There is a host of similar alternatives, most of them free, that will run many of the same software packages and could be more suited to the task at hand. Many argue that Linux does not have compatibility with Microsoft on the desktop or is not secure enough for the server environment. In this article we look at a group of UNIX-based systems that compete with Linux, and weigh up the pros and cons of each operating system.

MAC OS X

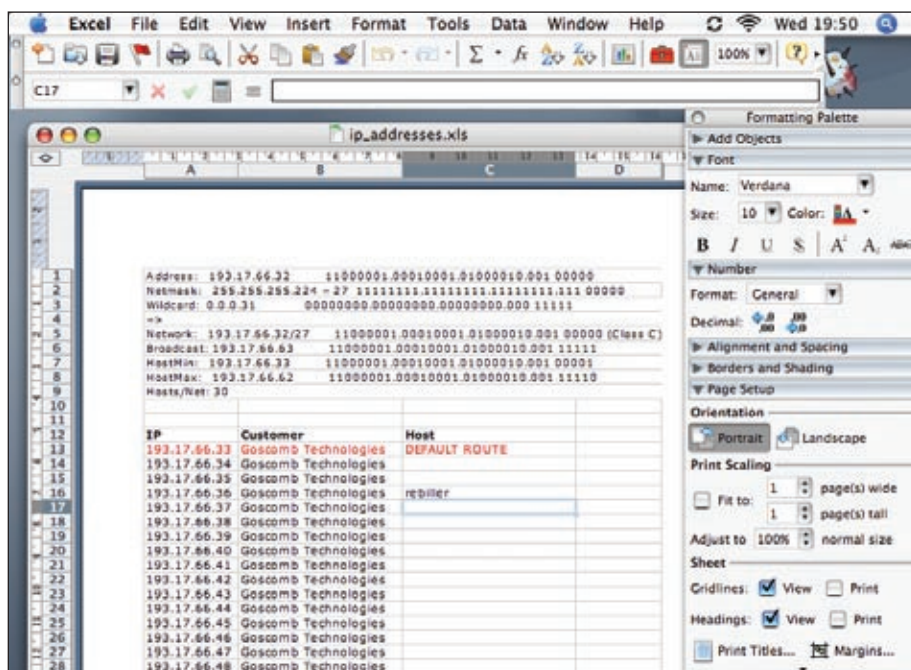
The first stable version of Mac OS X (Cheetah), which was released in March 2001, changed the face of the Mac completely. The company had done away with its old, proprietary code in favour of a new system based on FreeBSD. Certain parts of OS X such as the Aqua GUI are closed source, but the base distribution includes many open-source tools and programming languages, like any other UNIX system.

You can also use programs such as fink (<http://fink.sourceforge.net>) to install a wide range of open-source applications that are not included in the base install. You should be able to run almost anything on OS X. At the time of writing, fink itself includes 5,764 packages. These range from

Evolution, a gtk-based email client, to the command-line web browser Links.

Being a commercial and semi-closed source operating system, OS X has some huge advantages over its competitors. It can readily break into the desktop environment and is 100 per cent compatible with Microsoft Office. Because there is a release of Office for OS X, Mac users can share documents with Windows users very easily. As such, you can use a powerful and stable UNIX-based operating system but you aren't forced to use abiword, a gnome word processing package, gnumeric, a gnome spreadsheet package, or OpenOffice.org before you can open or create office documents.

The GUI in OS X outperforms any open-source solution currently available. Its tight integration and stunning looks are impressive. Configuration is simple, and while you can play with the command line there's no need to run it if you don't want to. Most users love the fact that you can just put a DVD in the drive and it will play, without having to compile DVD decryption libraries such as DeCSS and manually start up a player program. Put an SD card in a memory reader from your camera, and iPhoto will load and ask if you want to import the photos. The system has something to offer all levels, from first-time UNIX users to seasoned pros who started on mainframes and shun anything but a command line.



The OS X version of Microsoft Excel, as well as many other popular desktop office applications, will look familiar to regular Windows users, although the desktop is different – and arguably better



Unfortunately, OS X does not make use of the X11 protocol in its GUI. Like Microsoft Windows, Aqua is not compatible with X11. If you want to run an X11 application, you first need to run a separate X11 server as an application within Aqua. This means if you want to run applications such as Evolution, you need to run them within this X11 program. Window management becomes fairly complicated if you use more than one X11 application at a time.

OS X is also distributed in a server version, which has additional tools for setting up and managing file, web, email and other servers. The server version is managed via the GUI, although the command line can also be used. This means it is easy for professionals and beginners to get a server up and running with minimal fuss.

There are several disadvantages to OS X. One could argue that a server does not need a GUI and therefore one should not be installed. Its extra programming code is a security risk because it could be exploited. As a general rule, all unwanted code should be cut from a computer. The smaller the code base, the less potential for security holes. Also, bear in mind that you won't be using the GUI except when setting up the system. The rest of the time it will sit idle but will still use a fair amount of system resources, especially memory. The graphical



OS X can also be used for entertainment purposes. It might not have the same extensive games selection as Windows, but it can play DVDs and movie files without any trouble

FROM SERVERS TO TOASTERS: OTHER BSDs EXPLORED

NETBSD

NetBSD comes from the same roots as FreeBSD. Its main advantage is its portability, but it is arguably the least popular of the three BSDs and certainly the least publicised.

NetBSD is available on 17 processor architectures, including i386 desktop PCs, 64-bit Sun Microsystems machines and MIPS-based handheld PCs. This means it can run on every popular architecture available today, and others besides. This is great for developers, who can write portable source code that will run on all those platforms. If you have an old SPARC or an Acorn lying around, NetBSD could allow you finally to put it to some use again, rather than leaving it to gather dust in the hope it will one day become a collector's item. You can also take advantage of the binary compatibility features of NetBSD to run programs such as the Linux version of VMware. This will allow you to run other operating systems such as Microsoft Windows.

NetBSD has similar goals to the other BSD projects, namely security and performance. It does not take security to the same extremes as OpenBSD, which we look at below. This makes it a candidate for desktop systems as well as servers. It uses a ports system for building and maintaining packages. This will deter users who are not familiar with the command line, and means that it takes longer to install the software and updates that you require.

Many people use NetBSD as a desktop operating system, though. The in-action gallery on the NetBSD site shows photos and screenshots of this operating system running on laptops, handhelds and even a toaster. The desktop and laptop installations show the latest applications

running, and you would not be able to tell the difference from the newest Linux distributions.

NetBSD is used by people such as scientists at NASA's Numerical Aerospace Simulation facility. They mainly use Alpha systems with lots of RAM and disk space upwards of a terabyte, and require a sound code base on which to build custom projects. This is a good sign that the code is stable as NASA is known to be meticulous about such things and cannot afford systems to go down.

NetBSD is equally at home on a desktop or server, but it provides support for a far larger number of platforms.

OPENBSD

OpenBSD was forked from version 1.0 of NetBSD in 1995 by Theo de Raadt, one of NetBSD's founders. The two versions have had a very different development path since that time.

The main aim of the OpenBSD project is proactive security. It has suffered only one remote hole in the default install in over eight years, which

is quite a feat. The other main aims of the project are portability, standardisation, correctness and integrated cryptography. In terms of portability, OpenBSD strives to support binaries from several systems including Solaris, FreeBSD, Linux and HP-UX. For this alone, OpenBSD is perfect for servers.

In many ways OpenBSD is similar to FreeBSD, which is not surprising as they have the same roots. However, the code in OpenBSD is scrutinised more thoroughly than code in Linux or FreeBSD. This offers great peace of mind if you are worried about security. However, some think OpenBSD occasionally takes things a little too far and makes software too difficult to use with the default settings. One package where this is apparent is Apache. Certain features are unusable due to the chroot jailing of the application. Chroot jailing is used a lot in OpenBSD. This can be a strong security measure, restricting processes to directories and reducing the damage of a successful hacker attack. But it can be problematic, particularly in environments where more than one user is involved.

Some argue that OpenBSD is geared towards routers, firewalls and computers dedicated to a single task. It shines in these environments due to its high security and low requirements for disk space and processor power. You can rest easy knowing that you have a secure computer in place. Package releases are not as quick as other BSD projects, and every package released to the OpenBSD ports tree must be audited first. OpenBSD is not generally used as a desktop for the same reasons, as your software would be comparatively old.

But if security and speed is what you're after, OpenBSD is ideal.



NetBSD will even run on a toaster, helping you keep track of the number of slices that have been toasted



configuration tools also leave something to be desired. Some open-source packages have such complicated and varying configuration files it may be impossible to write a comprehensive control suite for them. You'll always have more control by editing the configurations by hand.

One big difference between OS X and the other systems is in the way it boots. All OS X configuration is stored in XML configuration files, and these are vast and plentiful. The main disadvantage of OS X in desktop and server builds is the cost. You must have Apple hardware to run it. The system will not run on any other brand of computer, as it will not support the hardware. Apple charges over £100 for the system alone, which means you won't want to install OS X on an old redundant system and play around with it as you can with the free operating systems discussed here.

Apple is migrating to Intel hardware, though it has said OS X will be locked to Apple computers using digital rights management (DRM). However, to date at least two hackers have managed to get beta builds of OS X for Intel running on non-Apple hardware. Whether the final version will be as easily circumvented remains to be seen.

FREEBSD

FreeBSD is seen by many as Linux's main competitor in the open-source market, as well as being the most popular of the BSD platforms. These include FreeBSD, OpenBSD and NetBSD. FreeBSD is derived from BSD, the version of UNIX that was developed at the University of California, Berkeley. As with other open-source operating systems in this article, FreeBSD is developed and maintained by a large number of individuals around the world.

Unlike many modern Linux distributions, FreeBSD has no graphical installer. It is a multi-purpose system, which is equally at ease as a server or a desktop system. As such, the base installation is simple and compact, installing only those tools needed to boot and log in to the system, plus a few extras for debugging, editing files and building new programs. Therefore, FreeBSD is quite secure out of the box. Unless you specify otherwise, not even SSH is set up to listen for network connections, which makes the box impenetrable to remote hackers in its default state.

The FreeBSD package management system is very different to those in the Linux world. The closest thing to a Linux package management system is Gentoo's portage system. FreeBSD packages are stored simply as Makefiles. Upon entering the correct directory, issuing a make command and setting environment variables as required, the system will first calculate dependencies. For each package that needs to be installed, the system downloads the source of the application and any updates and patches the port's maintainer has specified. It then unpacks, patches and builds the software before installing it. Binary package management is also available for those who don't run compilers on their systems. This works much the same as Red Hat's RPM packages, although no automated retrieval and installation tool is available by default.

It can take a while to build a FreeBSD desktop box, but once complete it will look familiar to all Linux users. You will find almost all the software available in source code form for Linux is available on FreeBSD. Many system-specific applications have also been ported. If you just use the box and don't carry out any installation or maintenance, the computer will look the same as any Linux box that you have used, with the same themes, settings and even software. FreeBSD also runs many Linux binaries. It includes Linux Binary Compatibility, which allows you to run applications ranging from Doom and Quake to serious applications such as VMware and Oracle for Linux. So you should be able to run almost any Linux application on FreeBSD without any problems.

FreeBSD is probably not the best option for an open-source desktop box unless you want it for developing FreeBSD applications. This is because it takes a long time to configure everything to your taste. Linux distributions such as SuSE and Lindows, and Mac OS X, are far better options because they are designed specifically for the desktop and have well-thought-out installations of several packages that work well together. If you install a FreeBSD desktop system from scratch, don't expect CD-ROMs to mount automatically when you put them in the drive. Similarly, you won't be able to drag files into an application and have it open them seamlessly. Compiling X and Gnome or KDE also

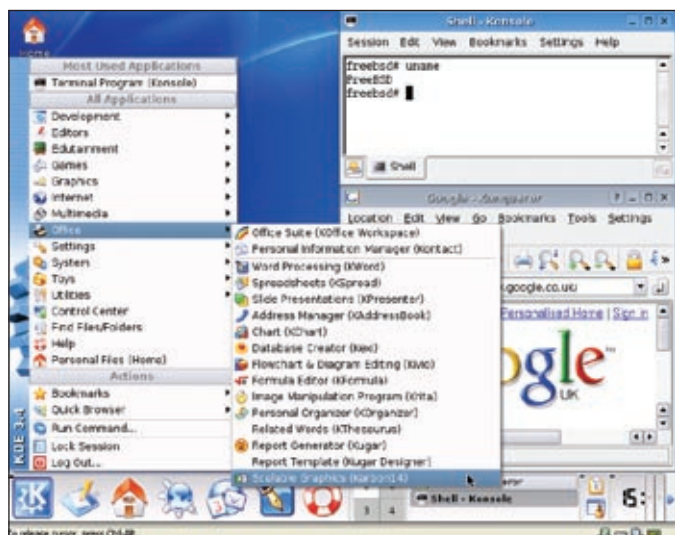
takes a long time, even on the fastest computers. Each time a package is updated it must be compiled from scratch, which takes far longer than a binary-based package management system. This could use valuable processor time while you are trying to work.

One of the best selling points of the FreeBSD system is its overall performance. It is regarded by many as the system of choice for running high-performance network applications, and will outrun other systems when compared on equal hardware. The largest and busiest FTP server on the internet (ftp.freessoftware.com) uses FreeBSD to transfer over a terabyte (1,024 gigabytes) of data every day. Yahoo! uses FreeBSD as its main server operating system because it can handle large amounts of data and maintain performance and stability.

There are several commercial support options available from various companies for the FreeBSD platform. Professional support is offered at all times and there is a lot of free, informal support available through Usenet newsgroups and mailing lists, including questions@freebsd.org. Once a problem is found, source code patches are often available within just a few hours. This makes it easy to maintain your computer and ensure that it is always up to date. This in turn will keep your system as secure as possible.

Security wise, FreeBSD is up there with the best. Patches for vulnerabilities are usually available within hours of disclosure and the system code is heavily audited before release, unlike the Linux kernel code. FreeBSD also has kernel security levels. These are far more powerful than simple run levels, as they allow the administrator to deny access to certain operating system functions such as reading /dev/mem, changing file system flags or writing to disks without mounting a file system. Once a certain secure level has been set, it cannot be reduced again without the computer being rebooted. This provides an extra layer of security to an already-running system; kernel modules may not be loaded and file systems cannot be tampered with, for instance.

The FreeBSD file system also adds a number of file flags that enhance the security of files. Combining these flags with correct secure levels gives you a very secure system. Flags include the



FreeBSD can run popular desktop environments, including KDE as shown here. Note the familiar Windows-style start menu. A wide variety of office software is included



Spot the difference: This is a Linux system running KDE, providing an identical experience for regular users. Only administrators will notice a significant difference



immutable (schg) flag, which won't allow any alteration to the file or directory unless you remove it, the append-only (sappnd) flag, the cannot delete (sunlnk) and the archive (arch) flag. FreeBSD has far better local security than any Linux system.

FreeBSD configuration files differ from Linux, in that most system-level configuration is done in /etc/rc.conf. All base-system, preinstalled application configuration files are also stored within /etc. User-installed programs hold their configuration files in /usr/local/etc. A major difference from Linux is the way in which applications are started. A shell script similar to those found in /etc/init.d is placed in the /usr/local/etc/rc.d directory. On booting, this directory is scanned and each script executed. Generally those scripts will check the presence of a variable in /etc/rc.conf and then start, depending on what is found. If a variable is not found, the program will not start.

FreeBSD's firewall technology is also very different from that of Linux systems. It runs a program called IP Filter (IPF), a very powerful packet-inspection firewall package. This is included in the base install, although it is not enabled by default. IPF can perform the same roles as iptables on Linux, but many consider it to have a friendlier configuration syntax, especially for beginners. FreeBSD can do everything Linux can in the firewall field, including NAT, packet filtering and more.

One nice extra feature of FreeBSD is that you can turn on the blackhole feature. This drops packets sent to non-listening ports, rather than rejecting them. This makes it harder for someone to scan your ports and get meaningful results. Even if you leave a port on your firewall open by mistake, the port will not appear to exist to an outsider.

FreeBSD is a secure, fast and stable operating system, best suited to high-performance network environments, but equally at home in the office or running small file servers.

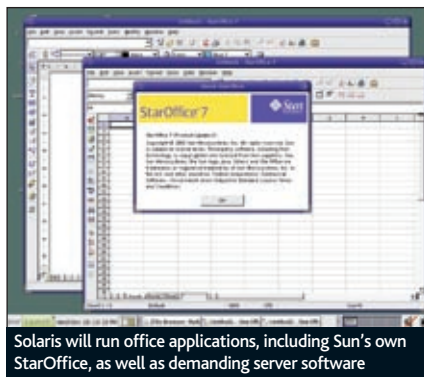
SOLARIS

Solaris from Sun Microsystems used to be a proprietary operating system, but recently the freely available OpenSolaris was released. It was originally based on the same BSD code as FreeBSD, NetBSD and OpenBSD, but in version five the base code was changed to a different system called System V.

Solaris is geared mainly towards Sun's own hardware, similar to the way Apple tailors OS X to run only on Apple hardware. However, the release of OpenSolaris should open the development process to anyone who's interested, so more hardware drivers may become available very quickly. Currently the list of supported hardware is very small compared to the BSD projects and the Linux kernel, and this is definitely a negative point for the system. But the support that it does provide, especially for Sun's own hardware, is rock solid.

Sun deals mainly in high-end servers and workstation computers. As such, Solaris's strengths lie in supporting massive amounts of memory and a high number of processors via Symmetric Multi-Processing (SMP). It is because of this that the CPU architecture support is extremely limited and you can use Solaris only with SPARC, x86 and x84_64 chips.

Up until version 10, the most recent release, Solaris was geared mainly towards servers, so the desktop environment was not as polished as most other systems. In version 10 and OpenSolaris,



Solaris will run office applications, including Sun's own StarOffice, as well as demanding server software

however, this has been improved massively and the system now uses the Java Desktop System, based on Gnome 2.2. Being a closed system, Solaris 10 also includes StarOffice 7.0, which offers compatibility with Microsoft documents.

If you own Sun hardware, Solaris will be your only sensible choice, as the operating system is tuned to the hardware. It is also better supported than any other operating system. Sun enterprise systems will almost certainly require Solaris to enable features such as hot-swapping CPUs and system boards, and other specialised system management operations. Solaris is used by many large companies and top banks due to its proven stability. Most Oracle installations run on top of Solaris, as until recently it was the predominant operating system supported by Oracle.

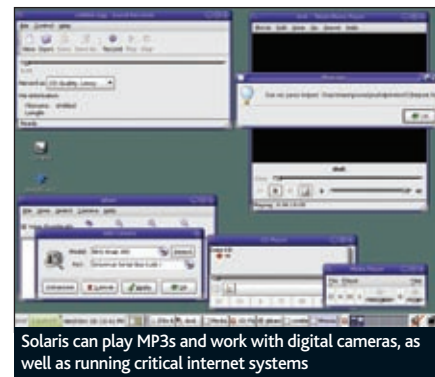
Solaris offers a very different updates system to those provided by the operating systems we've looked at so far. It provides a package called PatchPro, which automatically connects to Sun's servers and downloads and installs the latest required sets of patches for your system. This can be set to run automatically if you need it to, but this is not recommended because something may go wrong, and if it does, you'll want to be around to reverse the error.

A large amount of open-source software that has been pre-compiled for Solaris is available from the Sun Freeware website (www.sunfreeware.com). The aim of the project is to provide binary packages for open-source packages that are used most often and includes applications such as Apache, gcc and X Windows. This suite of binary packages is severely limited and nowhere near as in-depth as the ports trees of the BSD systems. However, it is still possible to install many applications from source, so a fair amount of software found in the BSD ports trees will also run on Solaris.

MINIX

MINIX was Linus Torvalds' inspiration to write Linux. It was created to provide examples for the principles set out in a text book that the author, Andrew Tanenbaum, had written. Linus Torvalds used many of the principles and practices found in MINIX when he was writing Linux, but he used a monolithic kernel rather than MINIX's micro-kernel approach.

MINIX is still under development and version 3.1 was released on 24th October 2005. Versions 1 and 2 were intended to be teaching tools to accompany books, but version 3 added the need to be usable as a serious system on resource-limited and embedded computers. At present MINIX supports only the x86 architecture and is aimed at small, low-powered devices. The minimum



Solaris can play MP3s and work with digital cameras, as well as running critical internet systems

amount of RAM required is 8MB, which is very little compared to the needs of most modern-day operating systems. Ports are under way to support the ARM7 and PowerPC architectures, which should widen the audience.

MINIX is nowhere near as mature as other operating systems and does not support as many applications or device drivers. However, it is being considered in the production of sub-\$100 laptops that will be distributed to children in developing parts of the world to assist learning, and it can run on other low-powered systems.

MINIX is an experimental system at present, so we don't recommend you use it in a production environment until it is more mature.

VERDICT

All these systems have similar aims. They are fast, powerful UNIX-based systems that emphasise flexibility over ease of use. However, they go about these aims in different ways.

At one end of the scale, we have the commercial operating systems geared towards specific hardware and best suited to those who own the appropriate proprietary hardware. If you are interested in buying a new computer for desktop use, it is well worth taking a look at the Apple offerings with OS X installed. This is the best UNIX-based desktop system because it supports so many commercial applications.

At the other end of the scale, we have BSDs that aim to be stable on all manner of systems. Which of these you choose depends on how you intend to use it. If you want to go down the desktop route using BSD, go for FreeBSD or NetBSD. For servers, any of the three will be suitable. For building routers, firewalls and computers dedicated to a single task that requires high security, OpenBSD is the obvious choice.

However, Linux is still best suited as the best choice for an open-source desktop system due to the huge amount of work being done to make it compete with Windows. If you do want to use an open-source system, Linux is still the best. Although Linux applications may be able to run on a BSD platform or similar, they are nowhere near as tightly integrated as on most desktop-orientated Linux systems and, therefore, they are not as easy to use efficiently. ☐

NEXT MONTH

SUSE 10

The latest release of SUSE Linux has been created by the openSUSE project. Is it any good? We find out